

Cross-ownership and Corporate Innovation

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Abstract. This article takes Chinese A-share listed companies from 2014 to 2022 as the research sample, and uses a multiple regression model to empirically test the relationship between cross-ownership and corporate innovation efficiency. Research has found that: (1) cross-ownership can improve the innovation efficiency of enterprises. (2) when the internal control quality of the enterprise is high and the legal system environment is good, the promoting effect of Cross-ownership on the innovation efficiency of the enterprise is more significant.

Keywords: cross-ownership; innovation efficiency; internal control; legal system environment.

1. Introduction

Innovation is the primary driving force for development, and using innovation to promote economic development can not only ensure the long-term development of enterprises, but also the key to achieving high-quality development. The improvement of enterprise innovation capability cannot be separated from the increase of research and development investment scale, and is also related to the improvement of enterprise innovation efficiency. Compared to directors and executives, shareholders are more concerned about the long-term development of the company, and corporate innovation, as an important investment project to gain core competitiveness and establish a foothold in the market, shareholders have the motivation and ability to influence corporate innovation behavior. Cross-ownership, as a newly emerging ownership entity in the capital market in recent years, can help enterprises obtain more resources, break through financing constraints, and their rich management experience and industry expertise can help improve corporate governance, alleviate agency problems, and ultimately enhance innovation efficiency. On the other hand, the pursuit of maximizing the value of the investment portfolio by cross-ownership makes them more inclined to collude, reduce innovation motivation and investment sensitivity, and thus suppress the innovation efficiency of the enterprise. Therefore, it is necessary to explore the impact relationship between cross-ownership and corporate innovation efficiency.

2. Research Hypotheses

Cross-ownership is an investment entity that combines expertise and experience with a large source of funds. When a company truly needs it, they are willing to provide lower cost funds to the holding company while maximizing the value of the investment portfolio. Cross-ownership accelerates the flow of information, builds a communication bridge between enterprises and capital owners, and promotes the disclosure of more specific, truthful, and objective information on innovation progress by improving the level of information disclosure (Park et al., 2019) [1]. This widely spreads the willingness and behavior of enterprises to carry out innovation activities, effectively reduces information asymmetry between enterprises and external stakeholders, enhances external stakeholders' investment confidence in enterprise innovation behavior, reduces risk premiums, and lowers debt financing costs. The supervision of external creditors can improve the efficiency of management's allocation of R&D funds and alleviate the adverse impact of moral hazard on innovation. The research results of Chen et al. (2021) [2] indicate that cross-ownership can influence a company's financing activities by mitigating adverse selection, and companies with chain shareholders can obtain more debt financing and equity financing when there are investment



opportunities. The expansion of financing channels and the reduction of financing costs can reduce the difficulty and high cost of financing caused by risk avoidance and other reasons for enterprises. Adequate investment in hiring and training R&D personnel, as well as advanced R&D equipment, can contribute to the transformation of innovative achievements and improve the efficiency of enterprise innovation.

Compared to ordinary shareholders, Cross-ownerships have accumulated rich governance experience and industry advantages due to holding multiple companies in the industry, possessing strong information collection and analysis capabilities, thus possessing certain information advantages. This not only reduces information asymmetry between them and chain enterprises, but also helps to timely understand the situation of management, reduce information asymmetry between themselves and management, and better supervise the decisions made by management. Cross-ownerships have stronger interpretation and discernment abilities in interpreting and judging financial statement information provided by management. They can discover opportunistic behavior of managers through comparative analysis among peers in the same industry, and adopt measures such as participating in high-level governance to constrain management behavior, forcing management to consider the interests of the vast majority of shareholders in daily business activities, thereby reducing management's subjective decision-making behavior. As the agency problem weakens, the focus of management shifts from pursuing self-interest to improving innovation efficiency. They will be more cautious in selecting innovation projects and allocating innovation resources reasonably. They will also use the shareholder network formed by chain shareholders to learn advanced knowledge and skills from other enterprises, cultivate innovation spirit and ability, and increase the probability of successful implementation of enterprise innovation strategies, thereby improving the innovation efficiency of the enterprise.

H1: Cross-ownership can enhance the innovation efficiency of enterprises.

3. Research Design

3.1. Sample Selection and Data Sources

This article selects Chinese A-share listed companies from 2014 to 2022 as the research sample and conducts some data processing on the sample. Firstly, we excluded samples of companies in the financial industries such as banking and insurance; Secondly, we excluded the sample of companies that went public that year; Thirdly, we excluded samples of companies processed by ST, * ST, and PT; Fourthly, we excluded the sample of companies whose assets are insufficient to cover their debts; Finally, we excluded the sample of companies with missing variables. To eliminate the impact of outliers on regression, we performed a 1% tail reduction on all continuous variables. Finally, 17347 observations were compiled. The data is sourced from CNRDS and CSMAR databases.

3.2. Variables and Measures

3.2.1. Dependent Variable.

Innovation Efficiency (IE): Hirshleifer et al. (2013) [3] and Chircop et al. (2020) [4] define enterprise innovation efficiency as the ratio of innovation output to innovation input in innovation activities. This article uses the logarithm of the number of patent applications filed by a company to the logarithm of R&D investment (IE) to measure the innovation efficiency of the company.

3.2.2. Independent Variable.

Cross-ownership (Cross): This article draws on the research of He and Huang (2017) [5] and constructs a cross-ownership variable according to the following steps: (1) Based on the quarterly files of the top ten shareholders in the CSMAR database, retain shareholders with a quarterly shareholding ratio greater than or equal to 5%. As mentioned earlier, multiple laws and regulations use a shareholding ratio of 5% as the equity threshold, and previous studies have generally found that

shareholders holding 5% equity have strong influence and can occupy an important position in business decision-making; (2) Match at the quarterly level how many shareholders of each company hold no less than 5% equity in other companies in the same industry; (3) Based on the number of cross-ownership at the quarterly level, calculate their annual average and add 1 to take the logarithm to obtain the cross-ownership quantity indicator(Cross_Num); If the enterprise has cross-ownership, Cross_Dum is 1, otherwise it is 0.

3.2.3. Control Variable.

Drawing on the research of Chircop et al. (2020) [4], Xu et al. (2023) [6], and others, this article selects asset liability ratio (Lev), firm age (FirmAge), cash flow ratio (Cashflow), firm size (Size), proportion of independent directors (Indep), equity balance (Balance), executive age (TMTAge), Soe, Big4, industry dummy variable, and year dummy variable as control variables.

4. Data analysis

4.1. Regression Analysis

The results showed that, after controlling for a series of control variables as well as industry and year, the coefficient between Cross-Num and Enterprise Innovation Efficiency (IE) was 0.006, showing a positive significance at the 1% level; The coefficient between Cross_Dum and Enterprise Innovation Efficiency (IE) is 0.003, which also shows a positive significance at the 5% level. Hypothesis H1 is supported and validated

Table 1. Cross-ownership and Enterprise Innovation Efficiency

Variables	IE	IE
Cross_Num	0.006***	
	(2.823)	
Cross_Dum		0.003**
		(2.403)
Controls	Yes	Yes
Industry	Yes	Yes
Year	Yes	Yes
N	17347	17347
Adj- R2	0.345	0.345

4.2. Further Analysis

4.2.1. Internal Control Quality.

The improvement of internal control quality in enterprises is conducive to the standardization of accounting information quality and the enhancement of information communication efficiency among various responsible departments. It facilitates the accurate and timely transmission of high-quality accounting information between different levels, reduces the cost and time of information collection and analysis for cross-ownership, strengthens communication between cross-ownership and other levels, and provides more convenience for cross-ownership to identify and supervise opportunistic behavior of management and urge managers to attach importance to innovation. Internal control ensures the balance of power among functional departments, and cross-ownerships play a supervisory and governance role through the appointment of directors and other channels, which greatly alleviates the principal-agent problem and urges management to improve the efficiency of innovation resource allocation and enhance the innovation efficiency of enterprises.

This article divides the entire sample into a high-quality internal control group and a low-quality internal control group based on the median of the internal control index, and then performs group

regression. The regression results indicate that the role of cross-ownership in improving innovation efficiency of enterprises is more significant when the quality of internal control is high.

4.2.2. Legal System Environment.

In areas with a good legal system environment, the legal and regulatory system is relatively complete, providing greater protection for investors and strengthening the enthusiasm of cross-ownership to participate in corporate governance. The improvement of information transparency reduces the difficulty of regulating cross-ownership and further alleviates agency problems, which is conducive to the improvement of innovation efficiency. At the same time, in a market environment with sound laws and regulations, regulatory agencies have high enforcement efficiency, and opportunistic behavior by management requires a significant cost. A good legal system environment has increased the willingness of external investors and credit institutions such as banks to provide funds. Cross-ownership with high social reputation can help enterprises more easily gain social trust, thereby helping them more easily obtain low-cost, long-term funds and accelerate the transformation of innovative achievements.

This article divides the variables of legal system environment into a good group and a bad group according to the median, and then conducts group regression. The regression results indicate that the role of cross-ownership in enhancing corporate innovation efficiency is more pronounced in a favorable legal system environment.

Table 2. Further Analysis

	IC=1	IC=0	IC=1	IC=0	Law=1	Law=0	Law=1	Law=0
Cross_Num	0.007***	0.003			0.006**	0.005		
	(2.729)	(1.052)			(2.242)	(1.530)		
Cross_Dum			0.005***	0.001			0.003*	0.003
			(2.606)	(0.575)			(1.765)	(1.454)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	8673	8674	8673	8674	8637	8710	8637	8710
Adj- R2	0.375	0.308	0.375	0.307	0.373	0.321	0.373	0.321

5. Summary

This article uses data from Chinese A-share listed companies from 2014 to 2022 and finds that cross-ownership improves innovation efficiency. When the quality of internal control is high and the legal system environment is good, the impact of cross-ownership on innovation efficiency is stronger.

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